

Name:

KEY

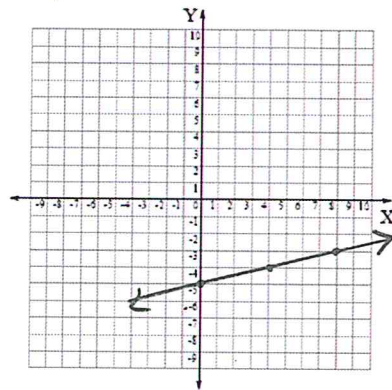
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Linear Equations:

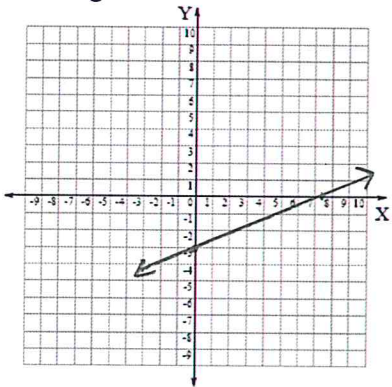
Choose **one** of the following functions to graph:

1)

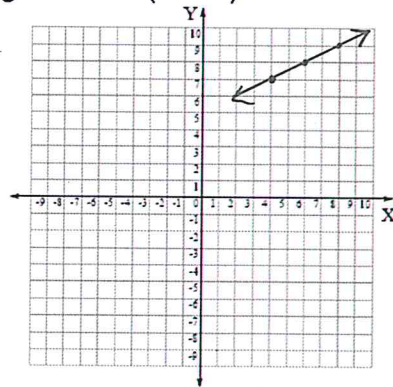
a. $y = \frac{1}{4}x - 5$



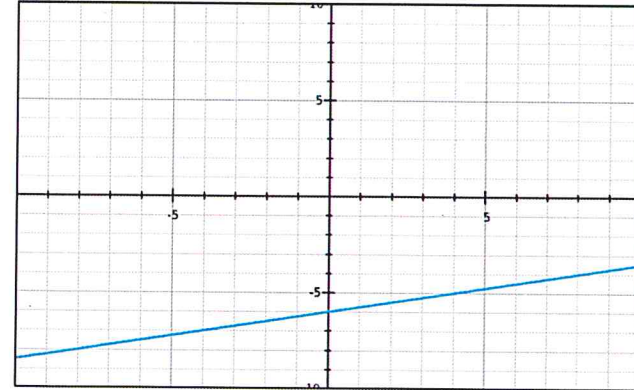
b. $2x - 5y = 15$



c. $y - 7 = \frac{1}{2}(x - 4)$



- 2) Using the graph below, write the equation of the line shown in **slope-intercept**, **point-slope**, or **standard** form.



$$y = \frac{1}{4}x - 6$$

- 3) Write the equation in **slope-intercept form** of the line that contains the point (1, 3) and is parallel to the line in problem #4.

$$y = \frac{1}{4}x + 2\frac{3}{4}$$

$$3 = \frac{1}{4}(1) + b$$

$$b = 2\frac{3}{4}$$

- 4) The Wicked Witch of the West is quickly melting. After only one minute, she is $5\frac{1}{2}$ feet tall. After only three minutes, she is $2\frac{1}{2}$ feet tall. How tall was she to begin with? After how many minutes will she disappear?

7 ft. tall to begin
 $4\frac{2}{3}$ min. to disappear

2 hrs. $\left(\begin{matrix} (1, 5\frac{1}{2}) \\ (3, 2\frac{1}{2}) \end{matrix} \right)$ down 3 in.

$$m = -\frac{3}{2}$$

$$5\frac{1}{2} = -\frac{3}{2}(1) + b$$

$$5\frac{1}{2} = -\frac{3}{2} + b$$

$$b = 7$$

$$y = -\frac{3}{2}x + 7$$

$$0 = -\frac{3}{2}x + 7$$

$$\frac{2}{3}\left(\frac{3}{2}x = 7\right)$$

$$x = \frac{14}{3} = 4\frac{2}{3}$$

5) Choose to solve **Part A or Part B:**a. Solve the following **two** systems of equations:

$$\begin{array}{r}
 \begin{cases} 5x + 3y = 9 \\ -5x + y = 3 \end{cases} \\
 \hline
 4y = 12 \\
 y = 3
 \end{array}
 \quad
 \underline{(0, 3)}$$

$$\begin{array}{r}
 \begin{cases} m = 4p - 3 \\ 2m + p = 3 \end{cases} \\
 2(4p - 3) + p = 3 \\
 8p - 6 + p = 3 \\
 9p = 9 \\
 p = 1
 \end{array}
 \quad
 \begin{array}{r}
 m = 1 \\
 \hline
 p = 1
 \end{array}$$

b. A quadratic equation in standard form contains the points (0, -7), (2, 7), and (3, 20). Find the equation.

$$y = ax^2 + bx + c$$

$$\begin{aligned}
 -7 &= a(0)^2 + b(0) + c \rightarrow -7 = c \\
 7 &= a(2)^2 + b(2) + c \rightarrow 7 = 4a + 2b + c \rightarrow 7 = 4a + 2b - 7 \rightarrow 14 = 4a + 2b \rightarrow 7 = 2a + b \rightarrow -7 = -2a - b \\
 20 &= a(3)^2 + b(3) + c \rightarrow 20 = 9a + 3b + c \rightarrow 20 = 9a + 3b - 7 \rightarrow 27 = 9a + 3b \rightarrow 9 = 3a + b \rightarrow 9 = 3a + b
 \end{aligned}$$

$$\begin{array}{r}
 2 = a \\
 b = 3
 \end{array}$$

6) Choose to solve **Part A or Part B:**

a. At Hershey Park, O'Shai and Jose ride the Lightning Racer and the Roller Soaker. They have to pay per ride. O'Shai rides the Lightning Racer three times and the Roller Soaker three times and has to pay \$17.70. Jose rides the Lightning Racer two times and the Roller Soaker three times and has to pay \$15.55. How much does each ride cost?

$$\begin{array}{r}
 3L + 3R = 17.70 \\
 -2L + 3R = 15.55 \\
 \hline
 L = \$2.15
 \end{array}$$

$$\begin{array}{r}
 LR = \$2.15 \\
 RR = \$3.75
 \end{array}$$

- b. Kalimah is responsible for buying a week's \$40 supply of food for Desdemona's mice and for the cats who live under our building. The food for the cats costs twice as much as that for the mice. She needs to feed 164 mice and 24 cats. Her budget is \$4240. How much can Kalimah spend on each cat?

$$c = 2m$$

$$164m + 24c = 4240$$

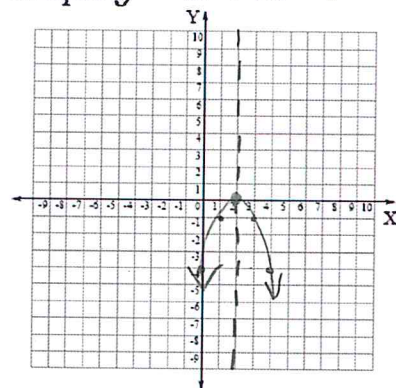
$$164m + 24(2m) = 4240$$

$$212m = 4240$$

$$m = 20$$

Quadratic Functions:Choose **Part A** or **Part B**:**Part A:**

- 7) Graph
- $y = -x^2 + 4x - 4$



$$x = \frac{-b}{2a} = \frac{-4}{-2} = 2$$

$$(2, 0)$$

- 8) Identify the following:

- a. Vertex:
b. Axis of symmetry:
c. Maximum/Minimum:
d. Zeroes:

$$(2, 0)$$

$$x = 2$$

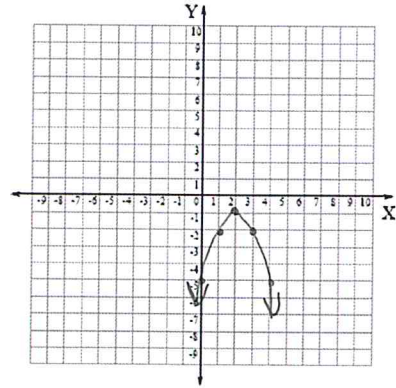
$$\text{max at } 0$$

$$x = 2$$

- 9) Rewrite
- $y = -x^2 + 4x - 4$
- in vertex form.

$$y = -1(x - 2)^2 + 0$$

- 10) Translate $y = -x^2 + 4x - 4$ so that its vertex is at $(2, -1)$.



- 11) Write the equation of your new function in vertex form or standard form.

$$y = -1(x-2)(x-2) - 1$$

$$y = -1(x^2 - 4x + 4) - 1$$

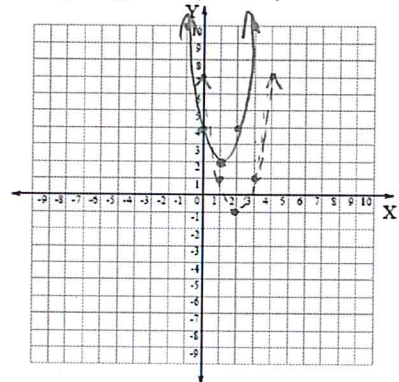
$$y = -x^2 + 4x - 5$$

$$y = -1(x-2)^2 - 1$$

$$y = -x^2 + 4x - 5$$

Part B:

- 7) Graph $y = 2(x-1)^2 + 2$



- 8) Identify the following:

a. Vertex:

$$(1, 2)$$

b. Axis of symmetry:

$$x = 1$$

c. Maximum/Minimum:

$$y = 2$$

d. Zeroes:

none

- 9) Rewrite $y = 2(x-1)^2 + 2$ in standard form.

$$y = 2(x-1)(x-1) + 2$$

$$2(x^2 - 2x + 1) + 2$$

$$2x^2 - 4x + 2 + 2$$

$$y = 2x^2 - 4x + 4$$

- 10) Translate $y = 2(x - 1)^2 + 2$ so that its vertex is at (2, -1) _____

- 11) Write the equation of your new function in vertex form or standard form.

$$y = 2(x - 2)^2 - 1$$

$$y = 2(x^2 - 4x + 4) - 1$$

$$y = 2(x - 2)^2 - 1$$

$$y = 2x^2 - 8x + 7$$

Solve problems 12 & 13.

- 12) Solve the following quadratic equation:
 $3x^2 + 10x - 8$

$$x = \frac{2}{3}, -4$$

$$x = \frac{-10 \pm \sqrt{100 + 96}}{6}$$

$$= \frac{-10 \pm 14}{6}$$

- 13) Solve by factoring using a quadratic pattern:
 $x^4 + 9x^2 = -20$

$$\pm 2i, \pm i\sqrt{5}$$

$$x^4 + 9x^2 + 20 = 0$$

$$(x^2 + 5)(x^2 + 4) = 0$$

$$x^2 + 5 = 0 \quad x^2 + 4 = 0$$

$$x^2 = -5 \quad x^2 = -4$$

$$x = \pm i\sqrt{5} \quad x = \pm 2i$$

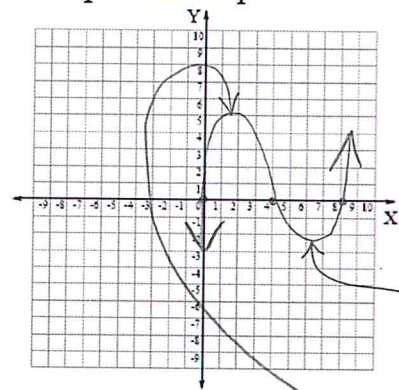
Polynomial Functions:

- 14) Write a polynomial function in standard form with zeroes at 0, 4, and 8. $y = x^3 - 12x^2 + 32x$

$$y = (x-0)(x-4)(x-8)$$

$$y = (x)(x^2 - 12x + 32)$$

- 15) Graph that equation.



- 16) Label the relative maximum and relative minimum on your graph above.

- 17) Solve: $x^3 - 12x - 12 = 0$ _____

Radical Functions:18) Choose **one** of the following expressions (a – d) to simplify:

a. $\sqrt[3]{27n^7}$

$$\underline{3n^2 \sqrt[3]{n}}$$

b. $\sqrt{6} \cdot \sqrt{24}$

$$\sqrt{2 \cdot 3 \cdot 2 \cdot 2 \cdot 2 \cdot 3}$$

$$\underline{12}$$

c. $\frac{\sqrt{27x^3}}{\sqrt{14xy^2}}$

$$= \frac{\sqrt{3 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x}}{\sqrt{14 \cdot x \cdot y \cdot y}} = \frac{3x\sqrt{3x}}{\sqrt{14}y}$$

$$\frac{3x\sqrt{3}}{\sqrt{14}} \cdot \frac{\sqrt{14}}{\sqrt{14}} =$$

$$\underline{\frac{3x\sqrt{42}}{14y}}$$

d. $2(8 + \sqrt{98})$

$$2(8 + 7\sqrt{2})$$

$$\underline{16 + 14\sqrt{2}}$$

19) Simplify. Rationalize the denominator:

$$\frac{10}{\sqrt[3]{5x^2}} \cdot \frac{\sqrt[3]{5 \cdot 5x}}{\sqrt[3]{5 \cdot 5x}} = \frac{10\sqrt[3]{25x}}{5x}$$

$$\underline{\frac{2\sqrt[3]{25x}}{x}}$$

20) Multiply: $(7 + \sqrt{5})(7 - \sqrt{5})$

$$49 - \sqrt{25}$$

$$49 - 5$$

$$\underline{44}$$

- 21) Simplify. Make sure to rationalize the denominator.

$$\frac{6-\sqrt{2}}{2+\sqrt{7}} \cdot \frac{2-\sqrt{7}}{2-\sqrt{7}} = \frac{12-\sqrt{14}}{4-7}$$

$$\frac{12-\sqrt{14}}{-3}$$

- 22) Simplify $(27)^{\frac{2}{5}}$

$$\sqrt[5]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}$$

- 23) Choose **one** of the following rational equations to solve:

a. $\sqrt{2m-6} = 3x+14$

$$\begin{aligned} (\sqrt{2m-6})^2 &= (3x+14)^2 \\ 2m-6 &= (3x+14)(3x+14) \\ 2m-6 &= 3x^2+84x+199 \\ 3x^2+82x+205 &= 0 \end{aligned}$$

b. $-1 + (27x)^{\frac{3}{4}} = 26$

$$(27x)^{\frac{3}{4}} = 27$$

$$27x = \sqrt[4]{27^4}$$

$$27x = \sqrt[4]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}$$

$$\frac{-82 \pm \sqrt{82^2 - 4(3)(205)}}{2(3)}$$

$$\frac{-82 \pm \sqrt{4264}}{6}$$

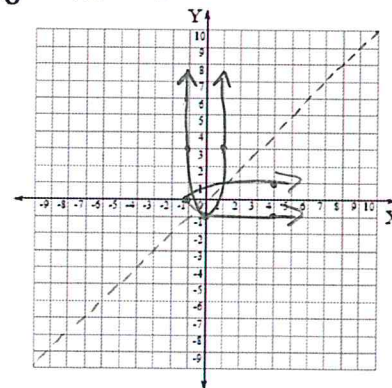
$$\frac{-82 \pm \sqrt{2 \cdot 2 \cdot 13 \cdot 41}}{6}$$

$$3$$

$$\begin{aligned} &\frac{-41 \pm \sqrt{1066}}{3} \\ &4264 \\ &\quad \swarrow \searrow \\ &2132 \quad 2 \\ &\quad \swarrow \searrow \\ &1066 \quad 2 \\ &\quad \swarrow \searrow \\ &533 \quad 2 \\ &41 \quad 13 \end{aligned}$$

- 24) Choose **one** of the following to solve:

- a. Graph the following function and its inverse. Is the inverse a function? $\cap \circ$
 $y = 4x^2 - 1$



b. Find the inverse of the following function.

Is the inverse a function?

$$y = 3x^3 - 5$$

$$x = 3y^3 - 5$$

$$x + 5 = 3y^3$$

$$\frac{x+5}{3} = y^3$$

$$\sqrt[3]{\frac{x+5}{3}} = y$$

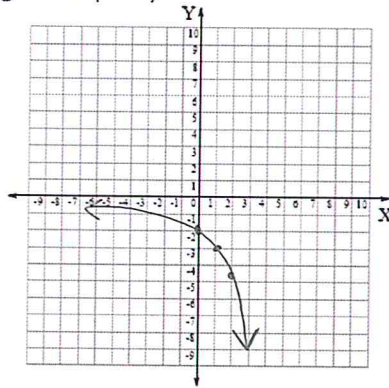
$$y = \sqrt[3]{\frac{x+5}{3}} \quad \text{yes}$$

Exponential Functions:

25) Choose **one** of the following to complete:

a. Graph the following exponential function:

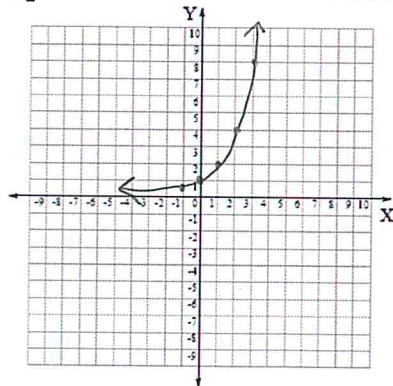
$$y = -2(1.5)^x$$



Identify the growth or decay rate of this function. 50% growth

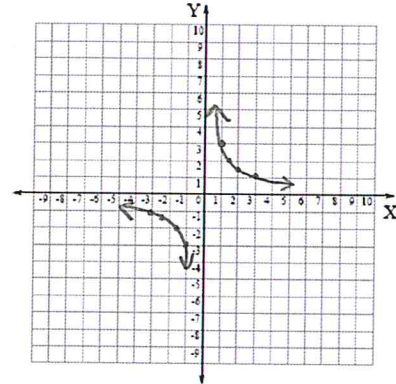
b. Kelly is making an origami swan. To begin she must fold her paper in half. Each time she makes a fold, she must fold her paper in half. Write and graph an equation to show this function.

$$y = 2^x$$



Rational Functions:

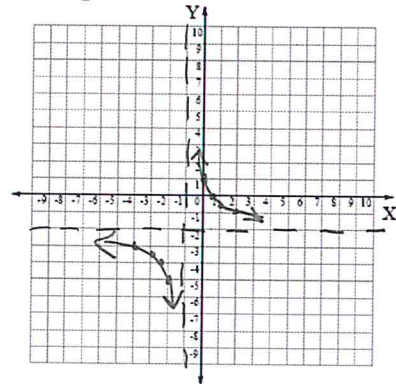
26) Graph $y = \frac{3}{x}$.



- 27) Rewrite this function to have asymptotes at $x = -1$ and $y = -2$.

$$y = \frac{3}{x+1} - 2$$

- 28) Graph this translation.



- 29) Find the vertical asymptotes, horizontal asymptotes, and holes in the graph of the following function:

$$\frac{x^2 + x - 6}{x^2 + 8x + 15}$$

- a. Vertical asymptotes: $x = -5$
 b. Horizontal asymptotes: $y = 1$
 c. Holes: $x = -3$

$$\frac{(x+3)(x-2)}{(x+3)(x+5)}$$

- 30) Choose **one** of the following to solve; make sure to state any restrictions on the variables:

a. $\frac{8y-4}{10y-5} \cdot \frac{5y-15}{3y-9}$

$$\frac{4(2y-1)}{5(2y-1)} \cdot \frac{5(y-3)}{3(y-3)}$$

$$\frac{4}{3}$$

$$y \neq \frac{1}{2}, 3$$

b. $\frac{x^2}{x^2 + 2x + 1} \div \frac{3x}{x^2 - 1}$

$$\frac{\cancel{(x)}(x)}{\cancel{(x+1)}(x+1)} \cdot \frac{\cancel{(x+1)}(x-1)}{(3)\cancel{(x)}}$$

$$\frac{x(x-1)}{3(x+1)}$$

$$x \neq 0, 1, -1$$

- 31) Choose **one** of the following to solve; make sure to state any restrictions on the variables:

a. $\frac{5x}{x^2 - x - 6} - \frac{4}{x^2 + 4x + 4}$

$$\frac{5x}{(x-3)(x+2)} - \frac{4}{(x+2)(x+2)}$$

$$\frac{5x(x+2)}{(x-3)(x+2)^2} - \frac{4(x-3)}{(x-3)(x+2)^2} \rightarrow \frac{5x+10x}{(x-3)(x+2)^2} - \frac{4x-12}{(x-3)(x+2)^2}$$

$$\frac{x}{\frac{3}{x} + \frac{1}{x}}$$

b.

$$\frac{x}{1} \div \frac{4}{x}$$

$$\frac{x^2}{4}$$

- 32) Solve the following equation. Check for extraneous solutions.

$$\frac{1}{v} + \frac{3v + 12}{v^2 - 5v} = \frac{7v - 56}{v^2 - 5v}$$

$$\frac{1}{v} + \frac{3v+12}{v(v-5)} = \frac{7v-56}{v(v-5)}$$

$$\frac{v-5}{v(v-5)} + \frac{3v+12}{v(v-5)} = \frac{7v-56}{v(v-5)}$$

$$\frac{4v+7}{v^2-5v} = \frac{7v-56}{v(v-5)}$$

$v = 21$

$$4v + 7 = 7v - 56$$

$$63 = 3\sqrt{\quad}$$